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PREPARATION AND CHARACTERIZATION OF SELECTIVE ABSORBANCE BIS (4-DIMETHYL AMINO DITHIO BENZIL) COMPLEX DYES COATINGS TO REFLECT LASER RADIATION THAT IN SURGERY ROOMS

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Abstract:

The Preparation dithio benzil dyes with high selective absorbance of Nd+3:YAG and Nd+3:glass laser Emission Spectrum and complexes were investigated and characterization by Fourier Transform Infrared (FT-IR) spectrum and visble near-Infrared spectrum (Vis-NIR) where stronger absorption peak showed a gentle alignment of the emission of lasers. After that adding these dyes to adhesive polymer to coat walls of surgery rooms and glasses to absorb the emissive rays of these lasers that effect on worker bodies .The importance of this research is ensure the safety of workers in the surgery rooms and appliance laser and reduce risk arising from interference radiation laser.

Key word: Dithoal dyes, High selective absorbance of Nd+3: YAG and Nd+3: Glass laser Emission Spectrum.

Introdution:

Today laser applications are more than being counted or counted, as today it is believed that the “laser is a solution looking for a problem.” The laser has become present with high efficiency and fineness in industrial applications such as welding, perforation, cutting, and surface hardening of materials, and medical applications such as skin surgery, nasal cavity and arteries Catheter and periscope, military applications such as laser range capabilities, laser radars, battle simulators, optical communication applications such as communications with satellites, space stations, remote sensing, and microstructure examination, and spectral applications such as radioisotope separation and Environmental pollution measurement and particle tracking Laser speedometer, commercial applications such as price code reader, laser industrial counter, standardization and laser quality control systems, technical applications such as holographic, stage lighting, advertising interfaces, and many other applications.

The use of lasers in medicine, precision surgery and the treatment of eye diseases and vision problems specifically because of the importance of this field for society.

Given the spectral properties of the dithio benzil complexes that distinguish them from the rest of the complexes, as they possess absorption beams in the near infrared region that are due to the electronic transitions of the C = C and C = S bonds of the chromophore group of the dithio benzil complexes such as the dithen dyes [1]. The spectral properties of some dithen complexes are very appropriate for use in a group of absorbent dyes of different wavelengths that serve multiple types of NIR near-red spectrum lasers.

And the importance of these dyes, as the absorbent materials are used in the preparation of protective coatings from radiation near-red spectrum laser, so the researchers focused their efforts on preparing the dithen dyes with the absorption characteristic of this type of radiation [2,3]

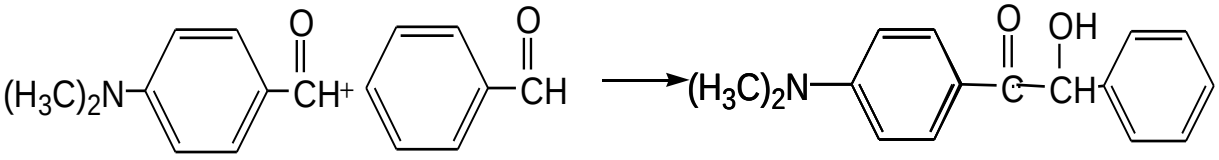
Materials and methods

Complex preparation method mix (0.1) mol of aromatic benzaldehyde and (0.1) mol of 4-dimethyl amino benzaldehyde second dissolved in (35) ml of ethyl alcohol Add to this mixture (0.037) mol of potassium cyanide dissolved in (18) ml of distilled water In a (250) ml beaker, place the condensing condenser and heat the mixture progressively for a reflexing between (4-1) hours depending on the type of benzoin prepared. Then the mixture is cooled in an ice bath for half an hour and crystals appear, passing water vapor through the solution to get rid of the unreacted aldehyde.

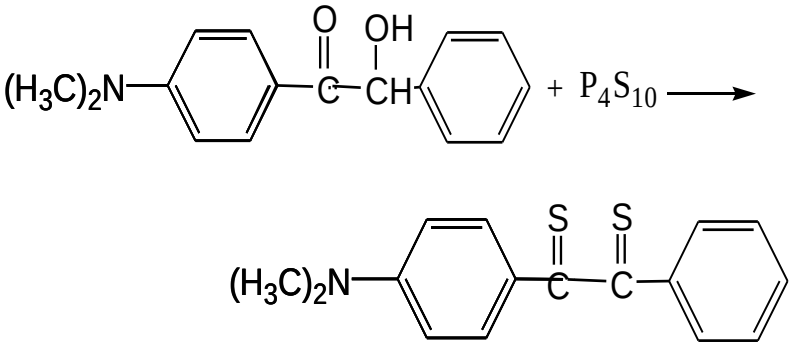
After that the crystals are washed with ethyl alcohol, then recrystallization with ethanol, so we get yellow or white crystals that are yellowish color is 4-di amino benzoin. BDM-I complexes are prepared as shown in chart (1) depending on the following method of preparation [4]:-

added (0.003mol) of phosphorous pentasulfide was added to a solution consisting of (0.1mol) benzoin dissolved in (10ml) dioxane in a reation flask with a capacity of (250) ml. Install an appropriate escalation condenser and preheat the mixture with a magnetic mixer equipped with an electric heater and continue heating until the mixture turns red. Stop the reaction, then cool the mixture in an ice bath for (15min). A viscous substance with a red color is separated and the solution is washed off with water. Distilled several times. To the sticky substance, add the central ion salt to the complex and an amount (3gm) dissolved in (5ml) of distilled water. Then add (4ml) concentrated hydrochloric acid and heat the mixture on a water bath with stirring for a period of (40-30) minutes

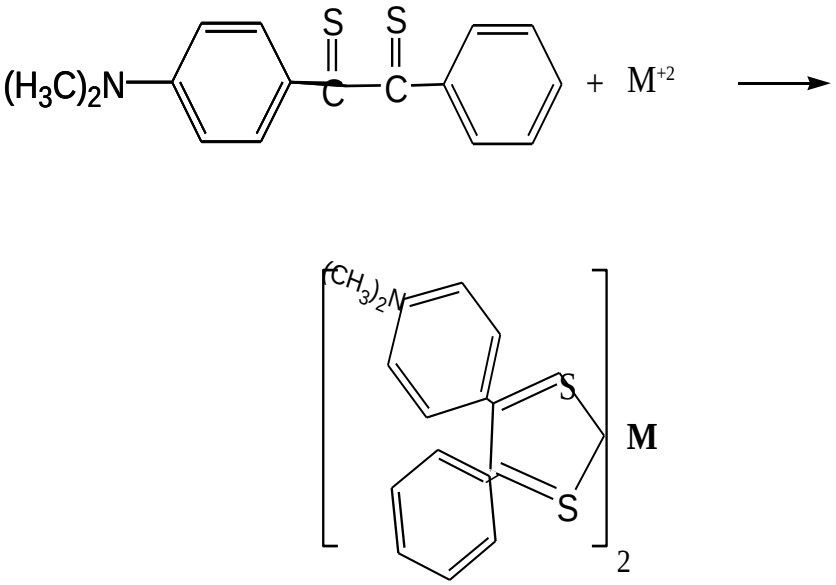
Hydrogen sulfide gas spreads in a foam form over a brown solution. After the mixture was cooled, a brown sticky substance separated, the viscous material was separated from the mixture and washed with distilled water several times. After returning the crystal, we get green crystals that are brownish. It was filtered and dried in the drying oven at (60ºC) for a period of (45min). (10ml) a basic solution of sodium hydroxide (6N) with an organic solvent was added to the previous crystals and by heating the mixture for (20min) and at a temperature of (70º C) separated Two layers, one of which contains the complex and the other aqueous. The organic layer was separated from the aqueous and dried in a drying oven for a period of time (1-1.5) hours. The result was a green (BDM-I) crystals, the crystal was returned to obtain crystals of high purity scheme (1) Explains the preparation steps,



4-dimethyl Amino Bnzoin



Dimethylamino ditho benzoin

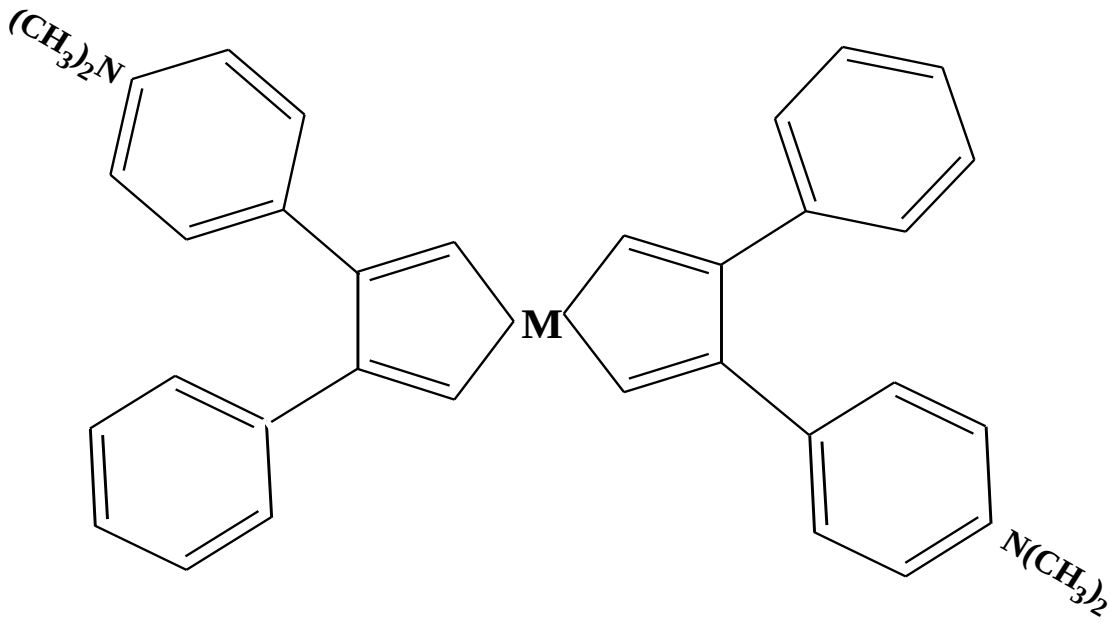


M=Ni,Pd,Pt

Bis(dimethyl amino dithio benzel) M

The formula of the BDM-I complex can be seen in Figure 1

M=Ni, Pd, Pt



BDM-I

$C_{32}H_{30}N_2S_4M$

FIGURE .1: BDM-I structural formula

Prepared ligands and complexes were investigated by Fourier Transform Infrared (FT-IR) spectrum

Prepared materials were investigated using the Perkin Elmer FT-IR Spectrophotometer model - 1720X

Infrared spectrum of compound 4 - dimethyl amino benzoin

Vibration groups	**Absorption bands(Cm) $^{-1}$**
Stretching vibration (O-H)	3410
Stretching vibration band(N-H)	2850 , 2790
Stretch vibration band (C = O) of the quinone group	1680
Stretching vibration band(C = C) for a benzene ring	1610 , 1585
) C – C (band Aliphatic Vibration	1405

Stretching vibration band (C-H)aromatic	1303
انحناء مطيN-ph Stretch bending band	1050
bending band C-H for bi-compensation benzene ring	802
bending band C-H for mono-compensation benzene ring	715

The infrared spectroscopy of 4-dimethyl amino benzoin showed the absorption bands shown in Table 1. Figure 2 illustrates the absorption spectrum of infrared radiation.

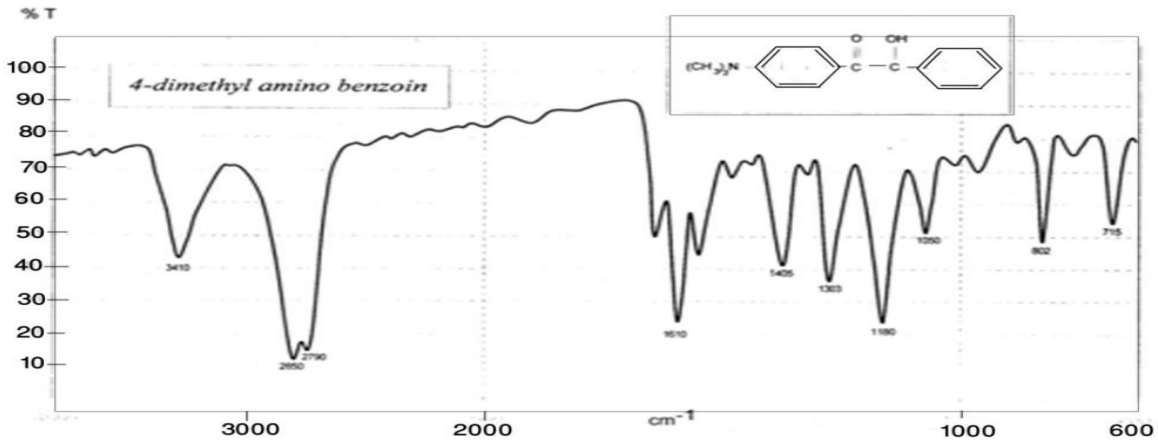


FIGURE 2- shows the infrared absorption spectrum of 4-dimethyl amino benzoin

Investigated of the complex Bis (4-dimethyl amino dithio benzil) (BDM-I)

The BDM-I complex was s investigated by studying infrared spectroscopy (FT-IR) and ultraviolet, visible, and infrared spectra, Shimadzu UV-Visible Recording Spectro Photometer UV 160..

Results of infrared spectroscopy for these complexes as shown in Table (2)
Figs (5), (4) and (3) represent the absorption spectrum of the complexes at the FTIR region

TABLE 2- Absorption bands for BDM-I complex

Vibration groups	**Absorption bands (Cm) $^{-1}$**
Stretching vibration band (C-H) aromatic	3000
Stretching vibration band (C-H) aliphatic	2900
Stretching vibration band(C=C) aromatic	1592-1600
Stretching vibration band(C=C) aromatic	1472
Bending vibration band (C-H) Keltic	1210, 1175
(C-S) Bending vibration band	810
) S – M (Bending vibration band	320-360
Bending band (S –Pd)	220 – 250

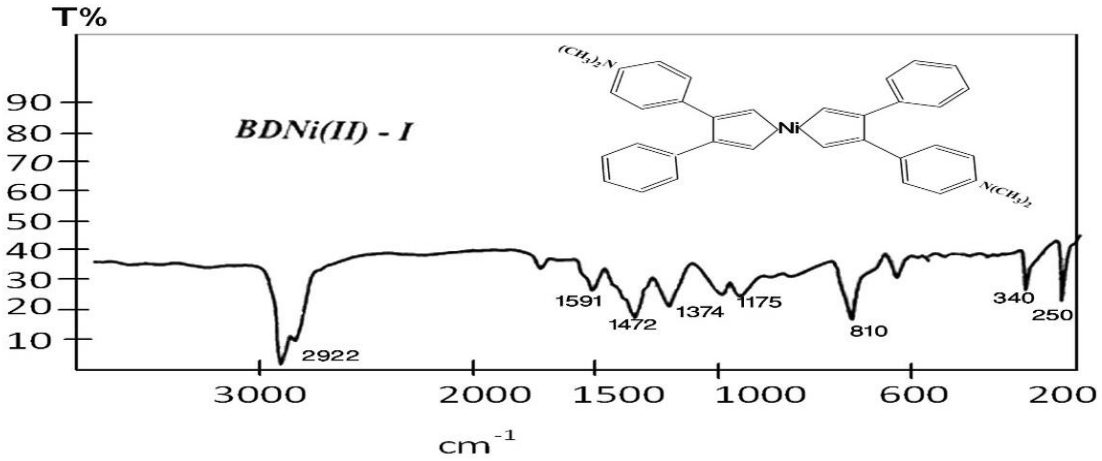


FIGURE -3: shows the infrared absorption spectrum of the BDNi-I complex

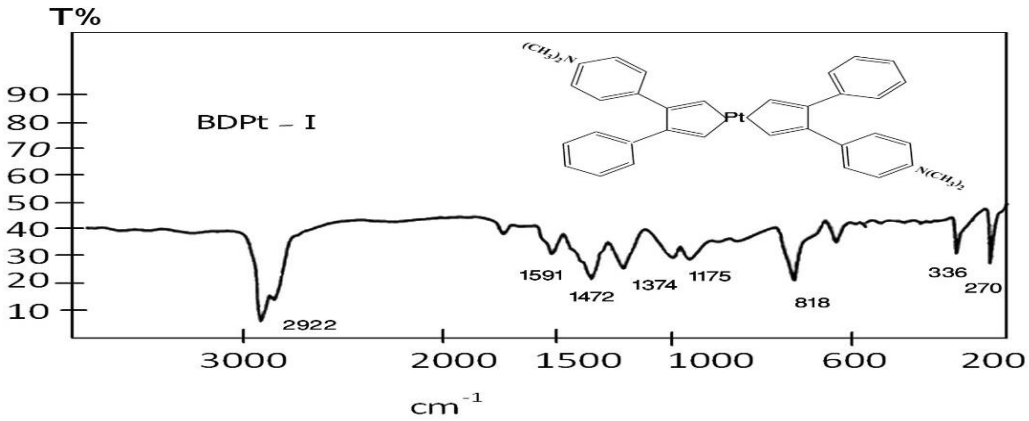


FIGURE -4: shows the infrared absorption spectrum of the BDPt-I complex

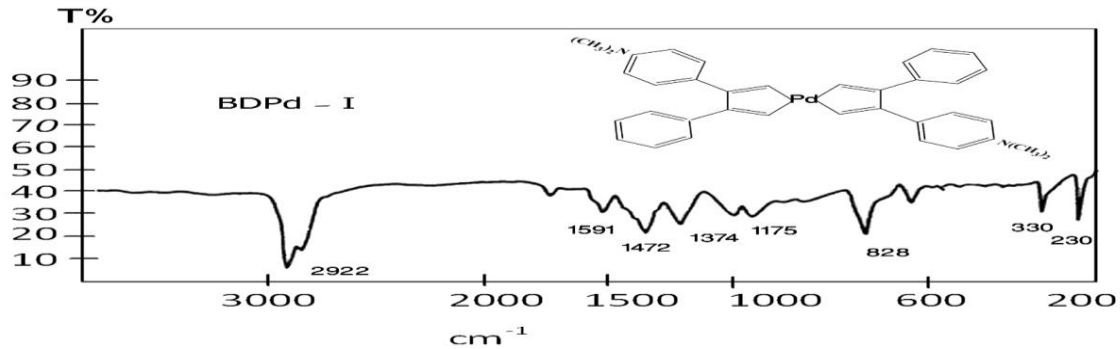


FIGURE -5: shows the infrared absorption spectrum of the BDPd-I complex

Spectrum dithio benzil complexes

Visible near infrared technique can be considered one of the most important techniques to study, characterize dithio benzil complexes and determine conformational structures and electronic properties.

A number of complexes showed a saturation absorption peak in near infrared region and represented the electronic transmission (π-π^*) of the chromophore group of prepared complexes
As shown in the following figures (6), (7) and (8)

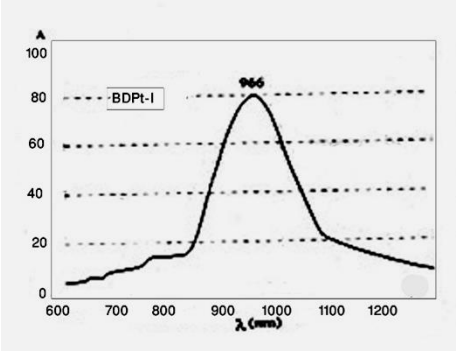


FIGURE 6 - represents the absorption peak of the BDNi-I complex

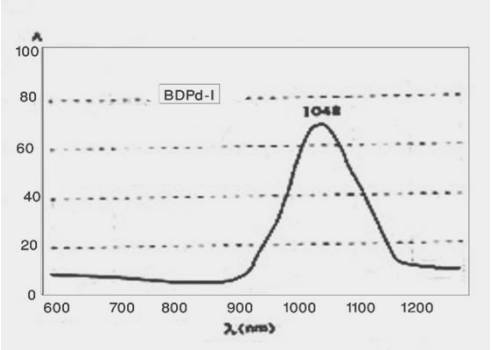


FIGURE 7 - represents the absorption peak of the BDPd-I complex

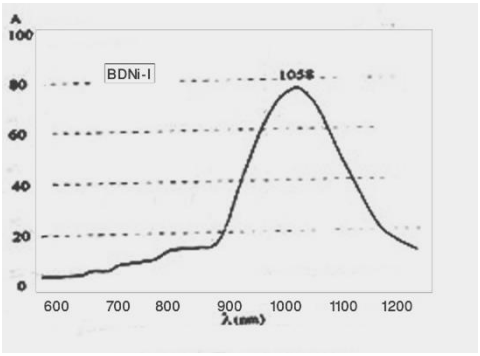


FIGURE 8 - represents the absorption peak of the BDPt-I complex

TABLE -3: The λ_{max} of absorption of complexes at the region near- Infrared spectrum.

R′, R	λ_{max} Ni^{+2}(nm)	λ_{max} Pd^{+2}(nm)	λ_{max} Pt^{+2}(nm)
R′ = H , R = $N(CH_3)_2$	1056	1048	966

preparation poly methyl methacrylate films doping by dithio benzil dyes

3g of polymethyl methacrylate is dissolved in 5 ml of chloroform and left for 24 hours 10-3M the dye dissolved in chloroform is added to the polymer and cast in glass plates and then drying by oven at (40ºC) degree for Three hours after that, they leave 12 hours and separate the films from the glass plates as shown in the figure (9).

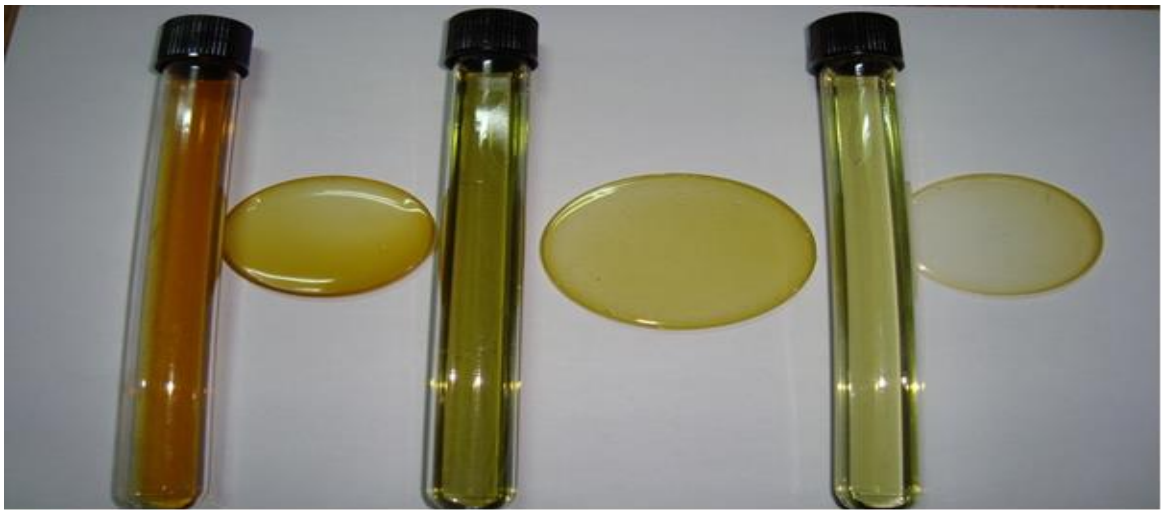


FIGURE. 9: poly methyl methacrylate films doping by dithio benzil dyes

Discussion:

Because the pigments (BDNi-I, BDPd-I, BDPt-I) possess absorption bands close to (1060 nm) at wavelengths (1056, 1048, 966 nm), respectively, they are used in coloring paint operating rooms using near-red lasers and also manufacturing Protective glasses,
.63ed the most important factors affecting spectral shift, including atomic number of central ion is donating electronic density. It is observed that the effect of the central ion of complexes with ligands with a strong electronic density. I prepared complexes using ions for the same group are Pt^{+2}, Pd^{+2}, Ni^{+2} for the same ligands. Shorter wavelengths when moving vertically within the group. This can be explained as Pt^{+2} ion heavier than Pd^{+2} and this is heavier than Ni^{+2}, and so the energy needed to raise the BDPt-I complex to the excitation levels is greater and shortest wavelength . and the BDNi-I complex band appear at longest wavelength.

The conclusion:

Due to the importance of high-power lasers in the scientific and medical fields, this process is still on the way to development. Specifically here, surgical procedures have used uncomplicated methods of protection that include the use of absorbent dyes. Work has been developed in this field and relying on the method of preparing a series of diethene complexes with absorption bands close to the wavelengths emitted by these lasers. Also, this method can be adopted to prepare saturated absorbent dyes at specific wavelengths depending on the central ion type and the substation groups on the ligand.

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